Series 3300 Multi-Function Meter with RS485 Communications

Series 3500 Multi-Function Meter with Ethernet Communications

Installation and User's Manual

Revision C
0XA6609-890000

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Definitions

5-point rolling average: The valuations method used for most 'instantaneous' readings, including volts, amps, VA, and demand. It consists of the average of the 5 most recent sample data, with samples occurring approximately every second.

Accuracy: The extent to which a given measurement agrees with the defined value.

Demand: The average power or related quantity over a specified period of time.

Demand-Maximum: The highest demand measured over a selected period of time.

Percentage Error: The difference between percentage registration and 100%.

Percentage Registration: The ratio of the actual registration to the true value, expressed as a percent.

Power-Active: The time average of the instantaneous power over one period of a wave, measured in Watts (W).

Power-Apparent: The product of rms current and voltage, measured in Volt-Amperes (VA).

Registration: The amount of electric energy, or other quantity, recorded by the meter.

1. Product Description

1.1 General Description

Series 3300/3500 Meters are revenue grade kWh electrical meters featuring Time of Use (TOU) meter readings, per-phase meter data, compatibility with either 3-phase Delta or Wye configurations, and a user friendly LCD display.

1.2 Meter Features

- Revenue-grade accuracy energy data with solid-core CTs or easy to install split-core CTs
- Wide operating temperature range
- Built in LCD display
- Battery backed-up real time clock (RTC) for TOU meter readings
- Low voltage detection
- CT reverse (energy direction) indicator arrow
- Voltage, current, and power consumption per phase
- Power Factor
- Communication Options:
    - RS485 Options (Series 3300)
        - Modbus RTU
        - BACnet MS/TP
    - Ethernet Options (Series 3500)
        - Modbus TCP/IP
        - BACnet
    - Isolated Pulse Outputs (10Wh and 1kWh), all models
- 10-year warranty

2. Technical Specifications

2.1 Part Number Keys

Series 3300/3500 Kits (CTs Included)

3 K U M R – 0 1 M

Series
3 = 3300/3500

Kit Type
K = Indoor Steel
O = Outdoor Plastic NEMA 4X

Voltage Rating
U = Universal (208-480VAC)

Communication Protocol
MR = Modbus RTU (3300)
BM = BACnet MS/TP (3300)
MT = Modbus TCP or BACnet IP (3500)

Meter Type
M = Multifunction

Amperage Rating & CT Type
01 = 100A Split Core
02 = 200A Split Core
04 = 400A Split Core
08 = 800A Split Core
16 = 1600A Split Core
30 = 3000A Split Core
50 = 5000A Split Core
1S = 100A Solid Core
2S = 200A Solid Core
4S = 400A Solid Core

Series 3300/3500 Meters (CTs ordered separately)

3 N U M R – 0 1 M

Series
3 = 3300/3500

Enclosure Type
N = Indoor Steel
R = Outdoor Plastic NEMA 4X

Voltage Rating
U = Universal (208-480VAC)

Communication Protocol
MR = Modbus RTU (3300)
BM = BACnet MS/TP (3300)
MT = Modbus TCP or BACnet IP (3500)

Meter Type
M = Multifunction

Amperage Rating
01 = 100A
02 = 200A
04 = 400A
08 = 800A
16 = 1600A
30 = 3000A
50 = 5000A

2.2 Serial Number Description

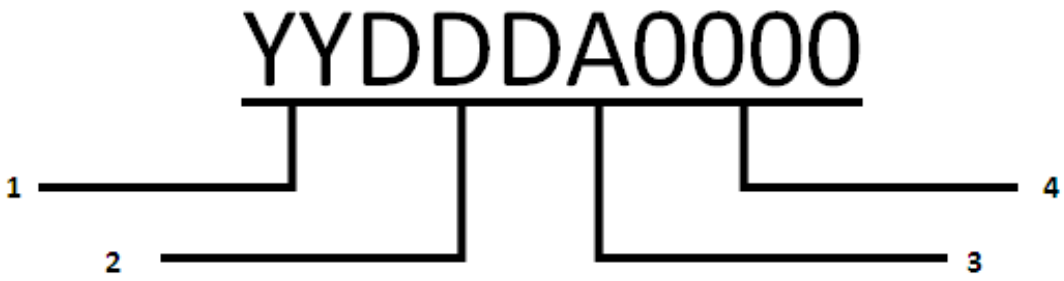


Figure 1: Series 3300/3500 Serial Number Format

1. YY: Last two digits of the manufacturing year
2. DDD: Day of manufacture, 1-366
3. A: First digit of meter serial number, alphabetic A-Z
4. 0000: Last four digits of meter serial number, numeric 0-9

For storage purposes, the last five digits of the serial number are converted to a hexadecimal number. For instance, meter C3591 is stored as 0x005C27.

2.3 Electrical Specifications

Input Configurations	No-Neutral Configurations* 3PH 3W 240VAC 3PH 3W 480VAC Neutral Configurations* 2PH 3W 120/208VAC 3PH 4W 120/208VAC 3PH 4W 240VAC Grounded Delta 3PH 4W 277/480VAC 3PH 4W 480VAC Grounded Delta * For all 2PH Configurations hot legs must be landed on L1 and L2.
Supply Voltage Range (Line 1 to Line 2)	177-552 VAC
Maximum Input Power	10.2 VA Max.
Maximum Rated Current	Primary: Max Rated Current + 10% Secondary: 0.11 A

Line Frequency	60 Hz
Power Factor Range	0.5 to 1.0 leading or lagging
Accuracy[1]	kWh: Compliant with ANSI C12.1
Meter Operating Temperature	-30 to +60 degrees C
Display Operating Temperature	-20 to +50 degrees C
Terminal Blocks	
Voltage Inputs	14 AWG, 12 in-lb of torque maximum
Current Transformers Inputs, Pulse and RS485 outputs	14-18 AWG, 4.4 in-lb of torque maximum

Table 1: Series 3300/3500 electrical specifications

[1]Accuracy based on Leviton solid-core current transformers with 100 mA max output. Meter input burden resistance at 1.62 Ohms.

[2]Pollution Degree 2: Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.

2.4 I/O Connections and User Display

Figure 2: Series 3300 Connections and Display

Voltage Inputs	**Description**
L1	Voltage Input, Line 1

L2	Voltage Input, Line 2
L3	Voltage Input, Line 3 (if provided)
N	Neutral input (if provided)
CT Inputs	
CT1 : X1	Current Transformer input, CT1. Colored wire of CT1
CT1 : X2	Current Transformer input, CT1. White wire of CT1
CT2 : X1	Current Transformer input, CT2. Colored wire of CT2
CT2 : X2	Current Transformer input, CT2. White wire of CT2
CT3 : X1	Current Transformer input, CT3. Colored wire of CT3
CT3 : X2	Current Transformer input, CT3. White wire of CT3
Isolated Pulse Outputs	
10 (+) Terminal 1	Real Energy (kWh) consumption (energy delivered) pulse output, collector connection of an NPN opto-isolated transistor. 10 Watthour (Wh) pulse rate (5 watthours on, 5 watthours off). V_{CE} = 70VDC; I_{CE} 50mA max
COM (-) Terminal 2	Common connection (emitters) for 10 Wh and 1 kWh Isolated Pulse Outputs.
1k (+) Terminal 3	Real Energy (kWh) consumption (energy delivered) pulse output, plus (+) connection (collector of an NPN opto-isolated transistor). 10 Watthour (Wh) pulse rate (500 watthours on, 500 watthours off). VB_{CE} = ?; I_{CE} Max = ?

RS485 Connections	For Modbus RTU and BACnet MS/TP. See Section 6 of this manual.
RJ-45	For Modbus TCP and BACnet IP. See Section 7 of this manual.

Table 2: Series 3300 I/O connections

3. Installation Instructions

The following section contains installation and wiring instructions for Series 3300 and Series 3500 meters in an outdoor or outdoor enclosure. If technical assistance is required at any point during the installation, contact information can be found at the end of this manual. Leviton is not responsible for damage to the meter caused by incorrect wiring.

3.1. Explanation of Warning Symbols

	Indicates the need to consult the operation manual due to the presence of a potential risk.
	Indicates the presence of electric shock hazards. Prior to proceeding, de-energize the circuit and consult the operation manual.
	Indicates that the equipment is protected throughout by double insulation.

Table 3: Warning symbols

3.2 Safety Precautions

WARNING

- **Installation of electric meters requires working with possibly hazardous voltages. These instructions are meant to be a supplement to aid trained, qualified professionals.**
- **Turn off all power supplying the equipment before performing any wiring operations. Use a properly rated voltage sensing device to confirm power is off.**
- **Bonding is not automatic for metal conduit connections; separate bonding is to be provided (see note 1).**
- **Installations should be done in accordance with local codes and current National Electric Code requirements.**
- **Equipment used in a manner not specified by this document impairs the protection provided by the equipment.**

Failure to follow these warnings could result in serious injury or death.

[1] Bonding kit must be UL recognized. Leviton recommends Rockwell Automation 855BM-ABK

3.3 Preparation

1. Verify the model number and electrical specifications of the device being installed to confirm they are appropriate for the intended electrical service (see Section 2).

2. Consult local codes for any possible permits or inspections required before beginning electrical work.

3. Outdoor applications: Ensure the conduit for the installation is flexible and non-metallic. Conduit and conduit fittings must be rated UL Type 4X. Failure to use the appropriate conduit impairs the degree of equipment protection.

4. Make sure all tools to be used during installation have proper insulation ratings.

5. Look inside the meter enclosure and electrical panel for possible exposed wire, broken wire, damaged components or loose connections.

3.4 List of Materials

- Series 3300/3500 Meter and associated mounting materials.
- Line 1, Line 2, Line 3 and Neutral hook-up wires as needed for the electrical service. 14 AWG wires recommended and 600VAC minimum rating required. Check local electrical code for compliance with regulations.
- List torque setting information.
- Current Transformers (CTs): This product is designed for use with Leviton CTs; see Section 3.7 for details.
- Conduit and fittings (see note 5 in Section 3.3).

3.5 Mounting the Enclosure

3.5.1 Mounting Location

- Series 3300/3500 meters require a switch or circuit breaker as part of the building installation.
- The switch or circuit breaker must be marked as the disconnecting device for the meter.
- It is recommended that the enclosure be mounted near the disconnecting device in an area with adequate ventilation.
- The enclosure should not be positioned in a manner that makes it difficult to operate the disconnecting device.
- Ensure that the lengths of the CT and voltage leads and conduit are capable of reaching the enclosure from the breaker panel. See Section 10.2 for more information.
- If a suitable mounting location near the panel cannot be found, additional in-line fuses or circuit breaker may be required in accordance with NEC regulations.

3.5.2 Making Conduit Holes

Steel (Indoor) Enclosure

The Series 3300/3500 steel enclosure comes with several 1 1/16" knockouts (3/4"conduit). Remove as needed to connect conduit fittings. Reference voltage and CT connections should enter in lower half of enclosure.

Outdoor Plastic Enclosure

The bottom, top, and non-hinge side of the plastic enclosure can be used as the conduit location in outdoor single meter enclosures. Reference voltage and CT wires should enter

in lower half of enclosure. If used, communication wires should enter in top-left of enclosure. Conduit openings should be as far away from inner components as possible for the installation. Opening sizes must be appropriate to fittings, and large enough to fit all voltage and CT wiring. Keep drill bit away from components inside the enclosure. Remove shavings from enclosure after drilling conduit holes.

3.5.3 Mounting Procedure and Conduit Installation

1. Fasten the enclosure to the selected surface using the mounting holes and appropriate screws. There are mounting holes on both top and bottom of each enclosure. See Figures 3 and 4 for mounting dimensions.
2. Upon mounting verify that the enclosure is not loose and that all connections are secure.
3. Attach the conduit between enclosure and distribution panel, routing wires as necessary for later use. For outdoor enclosures **UL Type 4X conduit and fittings must be used in order to maintain the outdoor rating of the enclosure.**
4. Ensure conduit fittings are aligned properly and tightened securely to prevent moisture from entering the enclosure (outdoor applications).

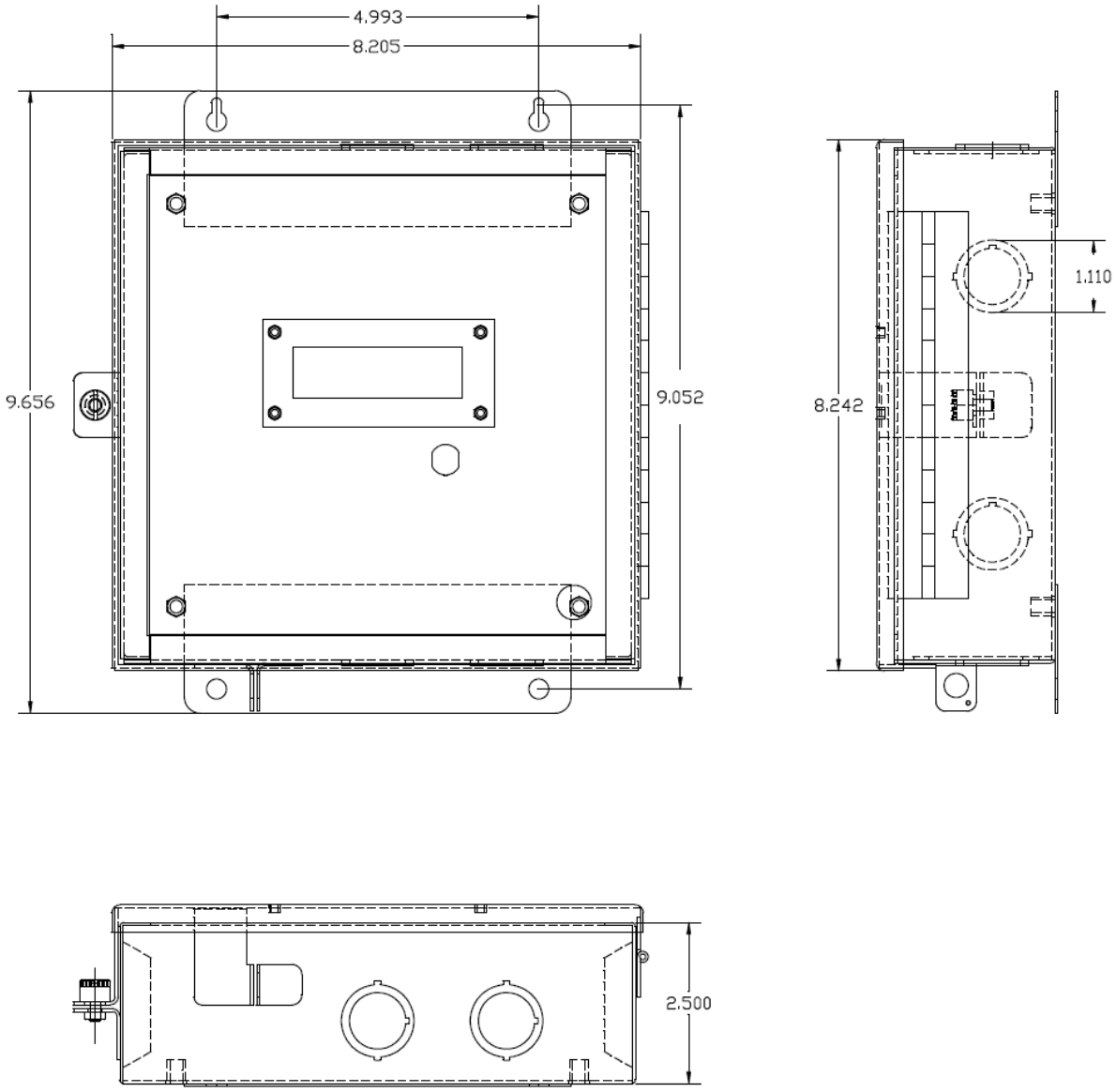


Figure 3: Series 3300/3500 Indoor Steel Enclosure Dimensions, in Inches

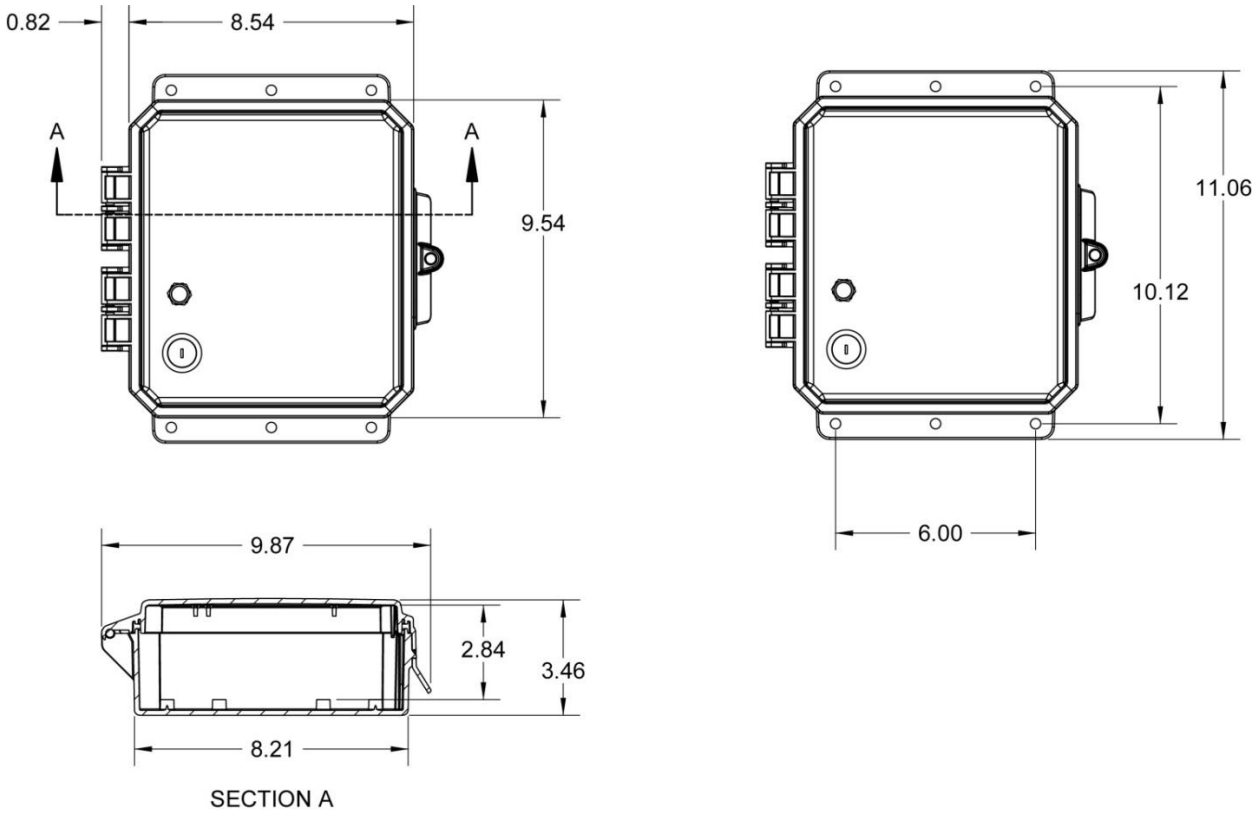


Figure 4: Series 3300/3500 Outdoor (plastic) Enclosure Dimensions, in Inches

3.6 Installation of Voltage Lines

Check to ensure service is disconnected before any connections are made. Verify if additional in line fuses are required based on National and Local electrical codes.

1. The Series 3300/3500 meter is compatible with both 3-phase 3-wire (no-neutral) and 3-phase 4-wire systems. The meter derives power from the Line 1 and Line 2 voltage connections, which must be between 177 and 552V for the meter to work properly. Field wired voltage connections are made to the Series 3300/3500 voltage terminal block. The rated torque for these terminal blocks is 12 in-lb., and can be used with 14 AWG solid or stranded copper wires.
2. Connect 600 V min. insulated wiring for Line voltages and Neutral to the appropriate locations in the breaker panel, in accordance with all national and local electrical codes; see Hookup Diagrams in Figures 8 – 11 below for correct wiring information.
3. Route wires through the conduit if not already done.
4. Trim the wire to the appropriate length to avoid coils of excess wiring.
5. Connect additional in line fuses if required.
6. For connections to the Series 3300/3500 pulse outputs: Route wiring through the top of the enclosure. Strip wiring to approximately .300 inches and connect to the appropriate

terminals. Wires should be tightened so that they are held snuggly in place, but do not to over-tighten, as this may compress and weaken the conductor.

3.7 Variations and Installation of Current Transformers

To reduce risk of electric shock, always open or disconnect the circuit from the power distribution system of a building before installing or servicing current transformers.

In accordance with NEC, CTs may not be installed in any panel board where they exceed 75% of the wiring space of any cross-sectional area.

General Requirements:

- Splices on the CT leads must be within the meter enclosure, not inside the conduit. Leviton provided CT leads are 48 inches minimum. Wire insulation should be stripped so that the bare conductor length that connects to the meter terminal block does not exceed 0.300 inches.
- CTs should be securely fastened such that they will not slide down to live terminals.
- Wires should be tightened so that they are held snuggly in place, but do not to over-tighten, as this may compress and weaken the conductor. Maximum rated torque for CT terminal blocks is 4.4 in-lb.
- Current and voltage inputs must be installed 'in phase' (e.g. CT1 on Line 1, CT2 on Line 2, CT3 on Line 3) and oriented correctly as shown in Hookup Diagrams in Figures 8 through 11.

CT Terminal Block in Place CT Terminal Block Removed

Figure 5: CT Terminal Block

CT Variations

- Leviton solid core CTs (Figure 6, left photo): In accordance with CT label, the LINE side of CT must face incoming Line. White lead connects to the appropriate X2 terminal. Black or colored lead connects to the appropriate X1 terminal.

Figure 6: Leviton solid core and Split Core CTs

- Leviton split core CTs (Figure 6, right photo): The side with the white dot, white label, or H1, must face the incoming LINE. White wire connects to X2 terminal, black wire connects to X1 terminal.
- The hash marks on the two pieces of a split core CT must align as shown in figure 7.

Figure 7: Hash Marks on Split Core CT

CT Installation Procedures

1. Route CT secondary wires through conduit if not already done.
2. Trim the wire to the appropriate length to avoid coils of excess wiring.
3. Strip wiring to approximately .300 inches.
4. Connect the CT leads to the appropriate terminals; see Hookup Diagrams in figures 8 through 11 below for correct CT orientations and connections. The CT terminal block is removable to make wire connections easier; see Figure 5. After securing CT wires to the appropriate terminals slide terminal block up into header until fully seated.
6. For Split Core CTs: Remove two thumb nuts (Figure 6) and remove section from CT. With power to the conductors turned off, place the 3-sided section of the CT around the appropriate conductor while ensuring that white label, white dot or H1 faces Line (source). Reassemble the CT while ensuring that the white hash marks align (figure 5) and reinstall thumb nuts. Repeat for remaining conductors for two or three phase applications, as shown in Figures 8 through 11.
7. For Solid Core CTs: With power turned off, disconnect each monitored conductor one at a time and slide on appropriate CT, ensuring the CT is correctly oriented as shown in Figures 8 through 11. Reconnect the conductors.

Hookup Diagrams, Figures 8 through 11

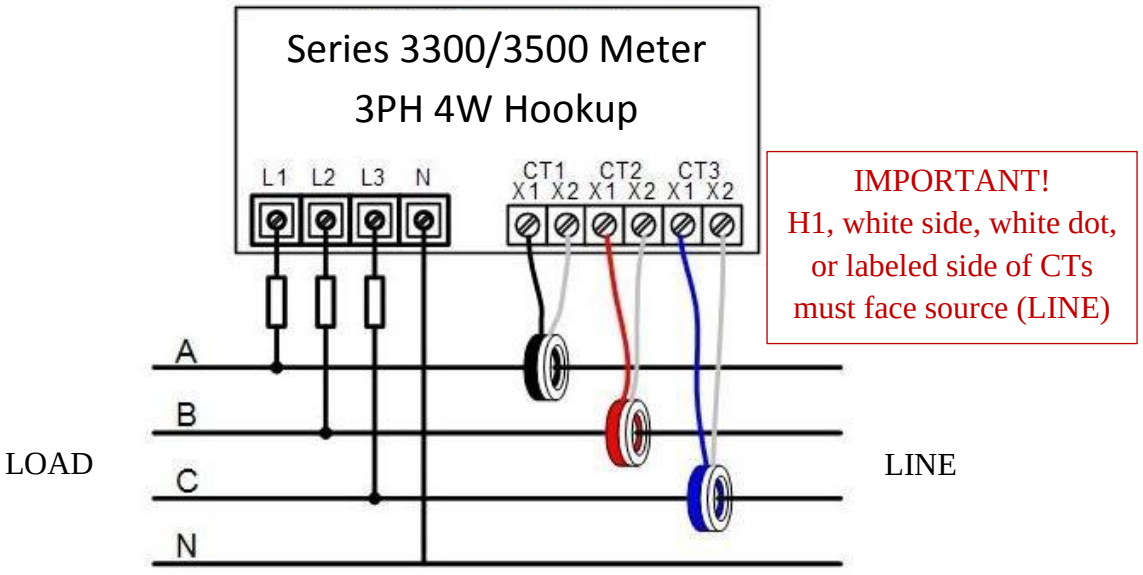


Figure 8: 3-phase 4-wire Wye hookup diagram

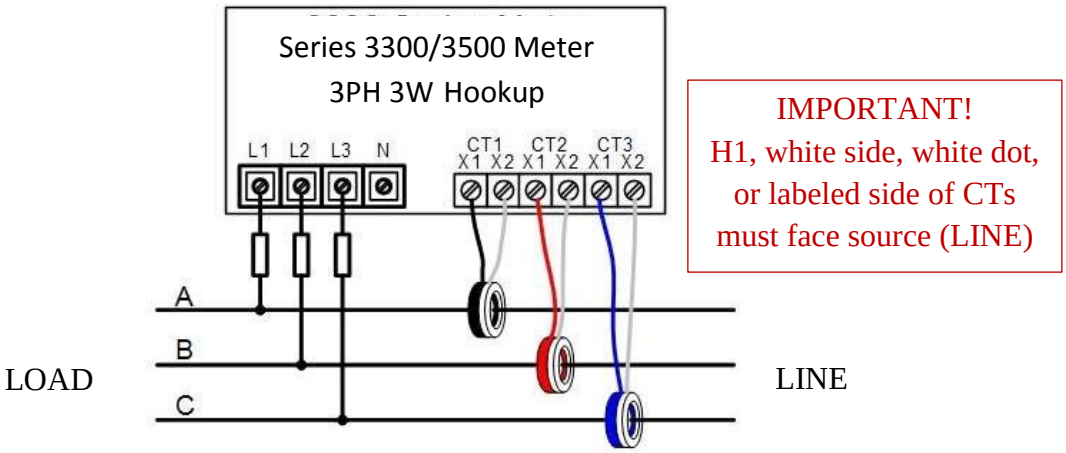


Figure 9: 3-phase, 3-wire (no-Neutral) hookup diagram

3.8 Securing the Enclosure

The outdoor enclosure ships with a padlock and key for securing the door after installation is complete. The indoor enclosure has a captive screw for securing the enclosure door.

3.9 Turning Power On and Checking for Correct Functionality

1. After installation is completed and enclosure has been secured the meter may be energized at the disconnect switch, upon which the meter will go through a power up sequence as described in Section 4.3. **It is strongly advised that users of this product read Section 4 below for a complete description of meter functionality and displayed values.**

2. Several diagnostic tools built into the Series 3300/3500 meter that should be utilized to ensure the meter and CTs are installed correctly and functioning properly:

    a. Energy Flow arrow – Indicates direction of 'energy flow' on amperage and kW screens.
    b. For mono-directional metering applications the Energy Flow arrow should always point to the right. If an Amperage or kW screen shows the arrow pointing to the left a current transformer may be installed backwards or on the wrong phase, or CT connections at the meter may be reversed or connected to the wrong CT input terminals, or voltage wires at the meter could be cross-phased. Section 4 further describes how the Amperage screens operate to indicate a reverse energy

condition. Refer to Hookup Diagrams in Figures 8 through 11 for correct wiring and CT orientations.

c. Power Factor Screens – Except in rare circumstances where predominantly inductive loads are metered, Power Factor values should have an absolute value greater than 0.6. A lower value indicates CTs installed on the wrong phase, backwards, or incorrectly connected at the meter, or voltage connections at the meter could be cross-phased. If PF is lower than 0.6 recheck CT placements and orientations and CT and voltage connections at the meter against the appropriate Hookup Diagram shown in Figures 8 through 11.

3. Bi-directional metering is typically used in grid-tied applications in which solar PV or energy from a source other than the utility grid is fed into the metered service. CTs are located between the grid and the electrical service so that if the locally generated energy exceeds the service loads, the grid will receive energy instead of delivering it. The Series 3300/3500 meter indicates energy direction with the Energy Flow arrow and blinking Amperage and phase indicator icons on the Amperage and kW screens.

4. General Metering Features and Functionality

4.1 Display

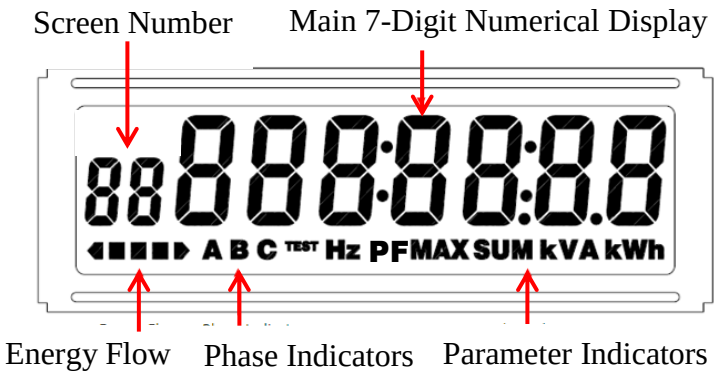


Figure 12: Custom LCD sections

Main Numerical Display and Scroll Button

The main numerical display section indicates the numerical value of the current item. After startup sequence (see section 4.3) the display will revert to Real Energy (kWh) delivered (consumed). The Scroll button on the enclosure door permits the user to scroll through nineteen screens of information (00-18) as shown in Table 4. Depress and hold scroll button for a few seconds to enter auto-scroll mode in which each screen appears for 4 seconds in the order shown in Table 4. To return to manual mode press and release the scroll button briefly (less than one second).

Phase Indicators and Parameter Indicators

The Phase and Parameter Indicator sections have two purposes. The Phase Indicators show the phase currently being displayed on per-phase values. Parameter Indicators are associated with values on the main numerical display.

- Low Voltage

  Low voltage (below minimum rated voltage with respect to neutral) on a phase is shown by a blinking of the 'V' Parameter Indicator in conjunction with corresponding Phase Indicator. For example, if low voltage is detected on phase A the 'V' Parameter Indicator and the 'A' phase indicator will blink simultaneously.

- Energy Flow Indicator

  On all Amps and kW screens the Energy Flow arrow will illuminate indicating energy direction. Arrow pointing to the right indicates energy delivered (from grid for grid-tied meters in renewable energy applications); arrow pointing to the left indicates energy received (to the grid). In addition to the arrow, the Amps parameter indicator ("A") and the corresponding phase indicator (A, B, or C) flash when Energy Flow arrow points left. **When meter is installed in a mono-directional metering application, the Amps and kW arrows should always point to the right when load current is present**.

4.2 Display Sequence and Screen Numbers

See Appendix B for examples of each display.

Table 4: Screen Numbers and Sequence Order

Screen Numbers & Sequence	Description of Displayed Value
00	Real Time Clock
01	Real Energy Delivered (kWh)
02	Maximum Demand (MAX KW)
03	Max Demand Time (MAX)
04	Max Demand Date (MAX)
05	Voltage(V) Phase A
06	Voltage (V) Phase B
07	Voltage (V) Phase C
08	Voltage (V) Line A to B
09	Voltage (V) Line B to C
10	Voltage (V) Line A to C
11	Phase A Amps (A)
12	Phase B Amps (A)
13	Phase C Amps (A)
14	Real Power (kW) Phase A
15	Real Power (kW) Phase B
16	Real Power (kW) Phase C
17	Real Power (SUM kW) A+B+C
18	Power Factor (PF) Phase A
19	Power Factor (PF) Phase B
20	Power Factor (PF) Phase C
21	Frequency (HZ)

4.3 Power-on Sequence

When the Series 3300/3500 meter is initially powered on it displays the following sequence of information:

1. Hello screen.
2. Meter Serial Number

The Meter Serial Number screen displays first. The lower left number is the alphabetical digit from the meter serial number (from 01=A to 26=Z), and the main display shows the numerical portion of the Serial Number. For example, a display showing "03" on the left and "6149" on the right below represents meter serial number XXXXXC6149, with the X's indicating the manufacturing day and year. See section 2.2 for more information on meter serial numbers.

3. Hardware Version -- The Hardware Version screen displays the word 'Hard' and the meter's hardware version.
4. Software Version -- The Software Version screen displays the word "Soft' and the meter's software version.
5. CT Ratio -- The CT Ratio screen displays the meter's programmed CT ratio. For instance, "400:0.1" indicates the meter has been calibrated for CTs with a 400:0.1A ratio.
6. Compute Engine Test Runs -- The compute engine performs 10 test runs before the meter starts normal operation. The test runs are indicated by the TEST icon and the words 'Pass X', where X is the test run number.

Once the startup sequence has completed the display defaults to Screen 01, Real Energy (kWh) delivered (consumed).

4.4 Descriptions of Displayed Information

Push and release the scroll button to cycle through the display screens. Each button press moves to the next screen in the sequence shown in table 4. After 5 minutes of inactivity on the scroll button the display will return to Screen 01, Real Energy Delivered (kWh) and remain there until the scroll button is depressed again.

Refer to section 4.1 for a description of how to set the meter into auto-scroll mode. In this mode the display is updated every four seconds to cycle through the screens automatically.

All displayed values update approximately once a second.

- **Screen 00 – Real Time Clock.** Real Time Clock (RTC) is factory set to Pacific Time (GMT-8). A factory-installed battery backup maintains the RTC before the meter is installed and in power loss situations.

  For information on replacing the battery, please see section 5. The RTC can be set using the communications port as described in sections 6 and 7 or by using the procedure outlined in Section 4.5.

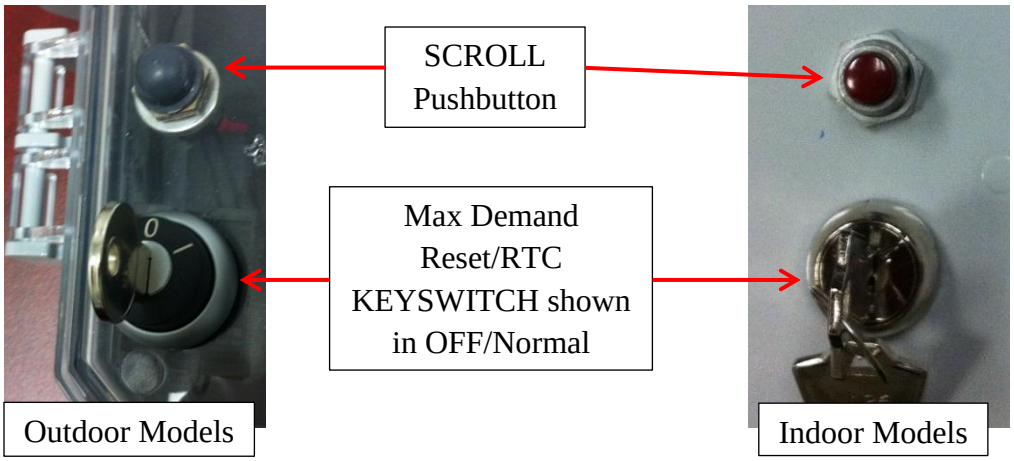
- **Screen 01 – kWh – Real Energy Delivered (consumed), non-resettable.** After initial startup the display reverts to and stays on this screen unless scroll or auto-scroll functions are initiated. The displayed value correlates to "kWh from grid" stored in Modbus or BACnet Address 0004 (see Sections 6 and 7). In the event of a power loss Real Energy Delivered data will be saved in EEPROM and retained even if backup battery is depleted. The direction arrow always points to the right to indicate energy consumed (delivered).

- **Screen 02 – kW Max – Maximum Demand** – can be calculated in 15 or 30 minute blocks. The default value from factory is 15 minutes. The interval can be changed using the RS485 communication port (see sections 6 and 7).
    - Sub-intervals – Each Max Demand data block has 3 sub-intervals in which demand is calculated. Sub-intervals are 5 minutes for a 15 minute Max Demand block and 10 minutes for a 30 minute block. For each sub-interval the total kWh consumption is divided by the number of accumulations to give average demand for the sub-interval. Accumulations occur approximately every second.
    - Max Demand calculation – After each sub-interval is finished, a new block demand is calculated. The block demand is comprised of the average of the 3 most recent sub-intervals. The largest block demand since a demand reset is stored as the maximum demand. When an update of the maximum demand occurs, the new value and current date and time are saved to EEPROM, Modbus Address 0060. Max Demand is displayed in kW.
    - Max Demand Reset. All series 3300/3500 meters have the capability to reset maximum demand. When maximum demand is reset, the maximum block demand and all current sub-interval demands are set to zero. An internal register is also incremented upon demand reset to keep a total of the times this action was taken. The register is a single byte, and rolls over at 255. The register content is accessible and Max Demand can be reset via the communications port; see sections 6 and 7. Max Demand also can be reset with the keyed switch on the meter enclosure door. Turn the key lock into the 'on' position for at least 5 seconds. When Max Demand is reset manual or via the coms port the LCD will give a visual confirmation that the demand was reset.
- **Screens 03 and 04** – Max Demand time and date – displayed immediately following the Max Demand screen.
- **Screens 05-13 – Voltage (V) and Amperage (A)**
    - Volts and Amps are saved and displayed as root mean square (RMS) values. Appropriate Phase Indicators and Display Indictors will illuminate as shown in Figure 12. On all Amps and kW screens the Energy Flow arrow will illuminate indicating energy direction. Arrow pointing to the right indicates energy delivered (from grid); arrow pointing to the left indicates energy received (to the grid, for grid-tied meters in renewable energy applications). In addition to the arrow, the Amps indicator ("A") and the corresponding phase indicator (A, B, or C) flash when Energy Flow arrow points left. If meter is installed in a mono-directional application, the Amps and kW arrows should always point to the right when load current is present.

- **Screens 14-17 – Real Power Delivered (consumed) kW A, kW B, kW C, kW SUM** - Also known as Instantaneous Demand – is a 5-point rolling average of individual and all phases (kW SUM). Displayed values correspond to "Phase A Real Power," "Phase B Real Power," "Phase C Real Power," and "Total Power (A+B+C)" in Modbus Register Map (see Appendix A).
- **Screens 18-20 – Power Factor (PF)** – Per-phase Power Factor is displayed. A lagging power factor is indicated by the Energy Flow arrow pointing to the left; for leading power factor arrow points to the right.
- **Screen 21 – Frequency (HZ)** – Displayed in Hertz.

4.5 Manually Setting the Real Time Clock

Figure 13: SCROLL and Max Demand/Clock Reset Switch on Outdoor Series 3300/3500 Meter



1. Press and hold the SCROLL pushbutton; see Figure 13.
2. While holding SCROLL, rotate the Max Demand Reset/RTC KEYSWITCH to the right into the RESET/ON position within 3 seconds and then release it. Date will be displayed and Year will flash.
3. Press SCROLL to advance the Year (you may also hold it down to advance automatically). The Year will cycle from 12 through 99 then back to 12 (for 2012 through 2099).
4. When the Year is set, rotate the KEYSWITCH to ON again and release. The Month will now flash.
5. Set the Month (1 to 12).
6. Repeat for Day of the Month (range varies by month and leap-year).
7. The next KEYSWITCH ON/release cycle will show the Time and flash the Hour.
8. Repeat the setting sequence for Hour (0-23), Minutes (0-59) and Seconds (0-59).
9. You may again perform KEYSWITCH ON/Release to cycle back to the Date settings, if desired.

10. The Date/Time setting mode will end automatically after no user activity for 10 seconds. The Date/Time settings will be stored and the meter will return to its normal display operation.

    Note:

    - The Day of the Week (Sunday through Saturday) is calculated and stored automatically by the meter.
    - Metering functions and communications are not affected during this Date/Time setting process.

5. Real Time Clock (RTC) Battery Replacement

If the battery depletes and no power is connected to the meter the RTC resets to 01/01/00 00:00:00 when power returns. The battery backup is a standard CR2025 lithium coin cell, rated at 3V and 165 mAh. The lifetime of the battery depends on the operating temperature of the meter, as shown in Table 5.

Operating Temperature (°C)	Estimated Battery Life (No external power) (Years)	Estimated Battery Life (90% power uptime) (Years)
Temp < 25	3	19
25 < Temp < 60	2	12
Temp > 60	1	9

Table 5: Battery Life Estimates

Since minimal current is drawn from the battery when the meter in powered on, most batteries do not need replaced over the lifetime of the meter. If a situation occurs in which the meter will be powered off for a prolonged period, battery life will be significantly reduced. In the event that the battery needs replaced while the meter is still in operation, follow the instructions below.

To reduce risk of electric shock, always open or disconnect the circuit from the power distribution system of a building before servicing an electric meter. Use a properly rated voltage sensing device to confirm power is off.

1. After de-energizing, open the meter enclosure.
2. Remove four screws to remove metrology cover (see Figure 12).
3. Grip the top metering board from both sides and pull to detach from the bottom board.
4. Remove the old battery from the coin slot with a pair of tweezers, noting the polarity.
5. Insert the new battery into the slot with the same polarity.

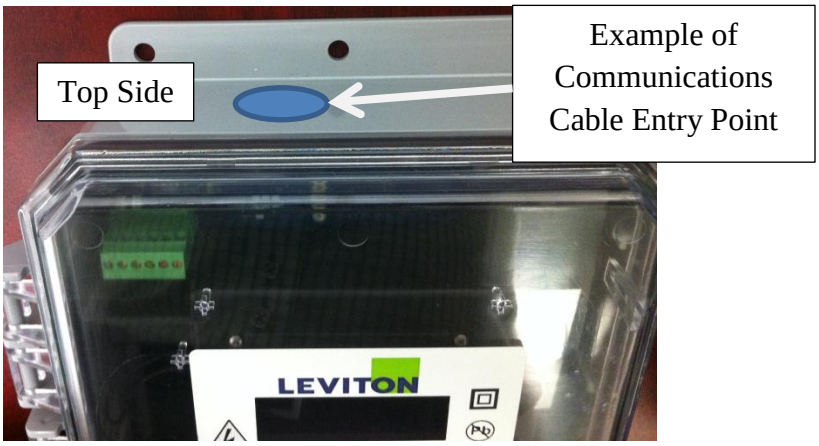
6. Reconnect the two boards, install the metrology cover with four screws, and close the enclosure.
7. Power on the circuit to verify the meter is still working properly.
8. Resynchronize the RTC using the communications port as described in Sections 6 and 7 or set manually using procedure described in Section 4.5.

Figure 12: Metrology Cover Screws

6. Communications – Series 3300 RS485 Communication Models

6.1 Modbus RTU Quick Start Guide

Figure 13: RS485 Cable Entry Location



To reduce risk of electric shock, always open or disconnect the circuit from the power distribution system of a building before servicing an electric meter. Use a properly rated voltage sensing device to confirm power is off.

1. Install meter as outlined in Section 3.
2. Modbus cable shall enter at the TOP side of the enclosure as shown in Figure 13. Use shielded twisted-pair cable to prevent interference. Replace plastic cap 33with webbed bushing (provided).
3. Connect Inverting (-), Non-Inverting (+), and Signal Common (C) wires using the 4-pin removable terminal block shown in Figure 14. Do not over-tighten the terminal screws. Modbus output is electrically isolated from input power.
4. Select Modbus address using the upper bank of DIP switches labeled "ADDRESS" as shown in Figure 15. Switch 1 corresponds to the low-order bit of the address and setting a switch ON selects a bit value of 1. For example, set switches 1 and 3 on to select address 5.
5. Select Modbus baud rate using the switches 1 and 2 in the lower bank of DIP switches, labeled "BAUD" as shown in Figure 15. Switches 3 – 8 are reserved for future use and must be set to the OFF position. Baud rate options are shown in Table 6.
6. Before energizing the meter close and secure the enclosure door.

Table 6. Modbus RTU Baud Rate Switch Settings

Switch				Baud Rate
B1	**B2**	**B3**	**B4**	
Off	Off	Off	Off	Auto
On	Off	Off	Off	9600
Off	On	Off	Off	19200
Off	Off	On	Off	38400
Off	Off	Off	On	76800

Figure 14. Modbus RTU Connection

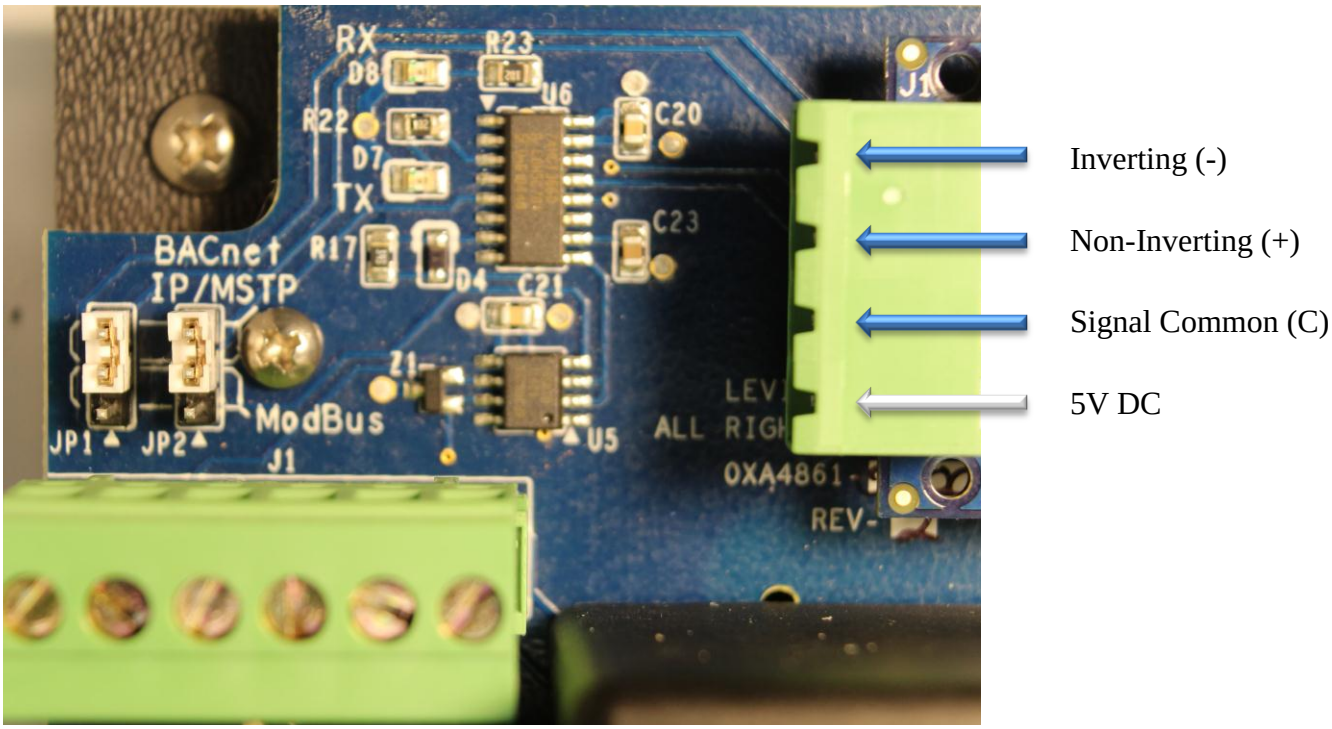
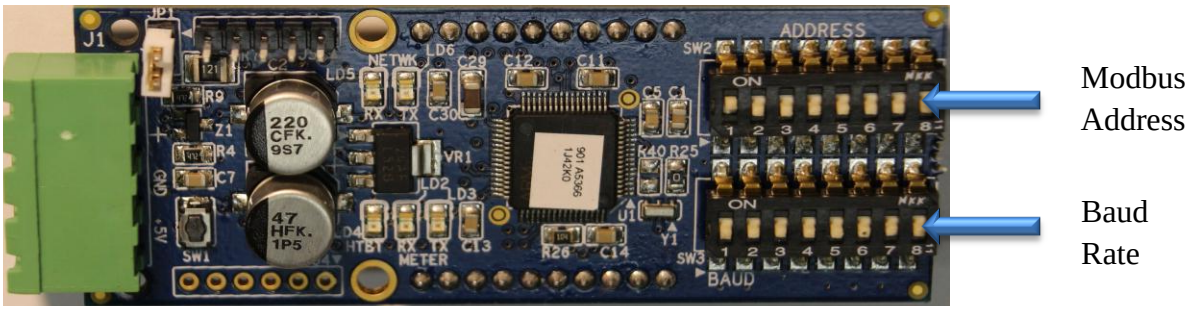


Figure 15. Modbus RTU Switches



6.2 BACnet MS/TP Quick Start Guide

To reduce risk of electric shock, always open or disconnect the circuit from the power distribution system of a building before servicing an electric meter. Use a properly rated voltage sensing device to confirm power is off.

1. Install meter as outlined in Section 3.
2. BACnet cable shall enter at the TOP side of the enclosure as shown in Figure 13. Use shielded twisted-pair cable to prevent interference. Replace plastic cap with webbed bushing (provided).
3. Connect Inverting (-), Non-Inverting (+), and Signal Common (C) wires using the 3-pin removable terminal block shown in Figure 16. Do not over-tighten the terminal screws. BACnet output is electrically isolated from input power.
4. Select the 8-bit MS/TP MAC address using DIP switches A1 – A8 (Figure 17. Switch A1 corresponds to the low-order bit of the address and setting a switch ON selects a bit value of 1. For example, set switches 1 and 2 on to select MAC address 3 (binary value 00000011).
5. Select the baud rate using DIP switches B1 – B4 as shown in Figure 17. Baud rate options are shown in Table 7.
6. Before energizing the meter close and secure the enclosure door.

Note: For detail information refer to FieldServer Website: www.fieldserver.com

Table 7. BACnet MS/TP Baud Rate Switch Settings

Switch				Baud Rate
B1	**B2**	**B3**	**B4**	
Off	Off	Off	Off	Auto
On	Off	Off	Off	110
Off	On	Off	Off	300
On	On	Off	Off	600
Off	Off	On	Off	1200
On	Off	On	Off	2400
Off	On	On	Off	4800
On	On	On	Off	9600
Off	Off	Off	On	19200
On	Off	Off	On	20833
Off	On	Off	On	28800
On	On	Off	On	38400
Off	Off	On	On	57600
On	Off	On	On	76800
Off	On	On	On	115200

Figure 16. BACnet MS/TP Connections

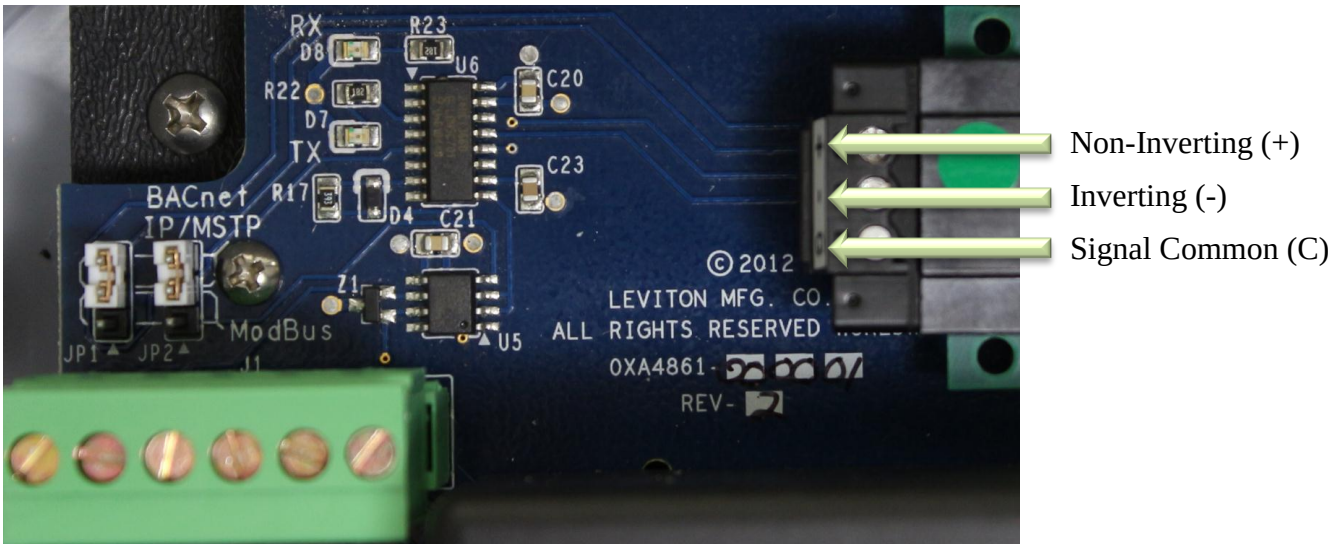


Figure 17. BACnet MS/TP Switches

7. Communications – Series 3500 Ethernet Models

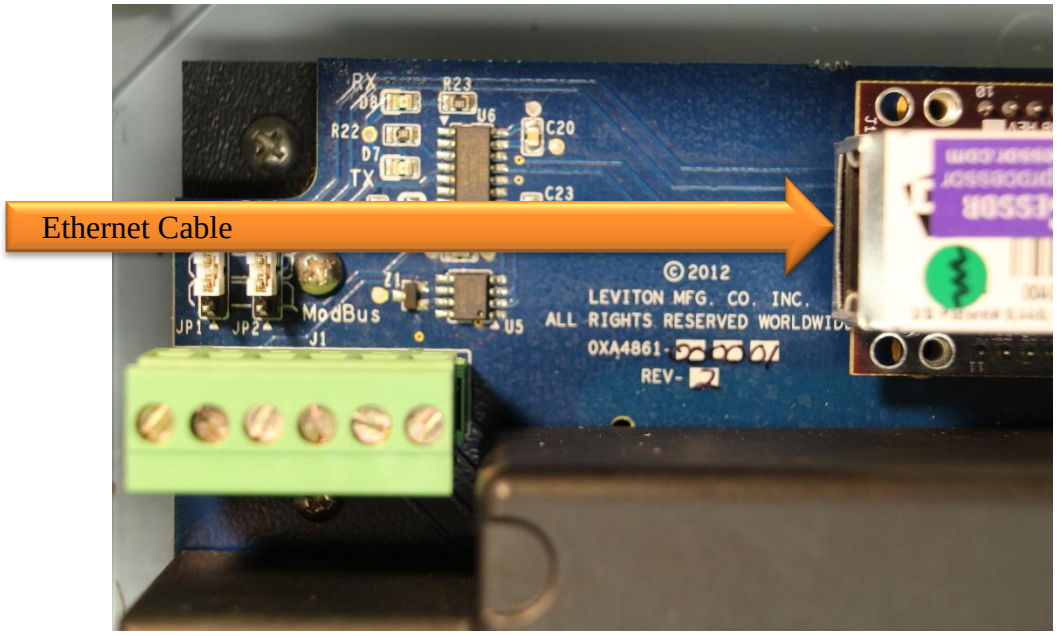
BACnet IP and Modbus TCP Quick Start Guide

To reduce risk of electric shock, always open or disconnect the circuit from the power distribution system of a building before servicing an electric meter. Use a properly rated voltage sensing device to confirm power is off.

1. Install meter as outlined in Section 3.
2. Ethernet cable (CAT-5e) shall enter at the TOP side of the enclosure as shown in Figure 13. Replace plastic cap with webbed bushing (provided).
3. Plug Ethernet connector into the RJ-45 jack as shown in Figure 18.
4. Before energizing the meter close and secure the enclosure door.

Note: For detail information refer to FieldServer Website: www.fieldserver.com

Figure 18. Ethernet Connection



8. Communications – History Data Extraction

When communicating with the meter base unit for historical data extraction, always send messages to Modbus address 83 regardless of the meter's normal Modbus address configuration.

For diagnostic purposes, history data can be extracted from the meter using a Modbus RTU connection to the meter base unit. This feature is intended for trained field service personnel only. Contact Leviton Customer Support for assistance.

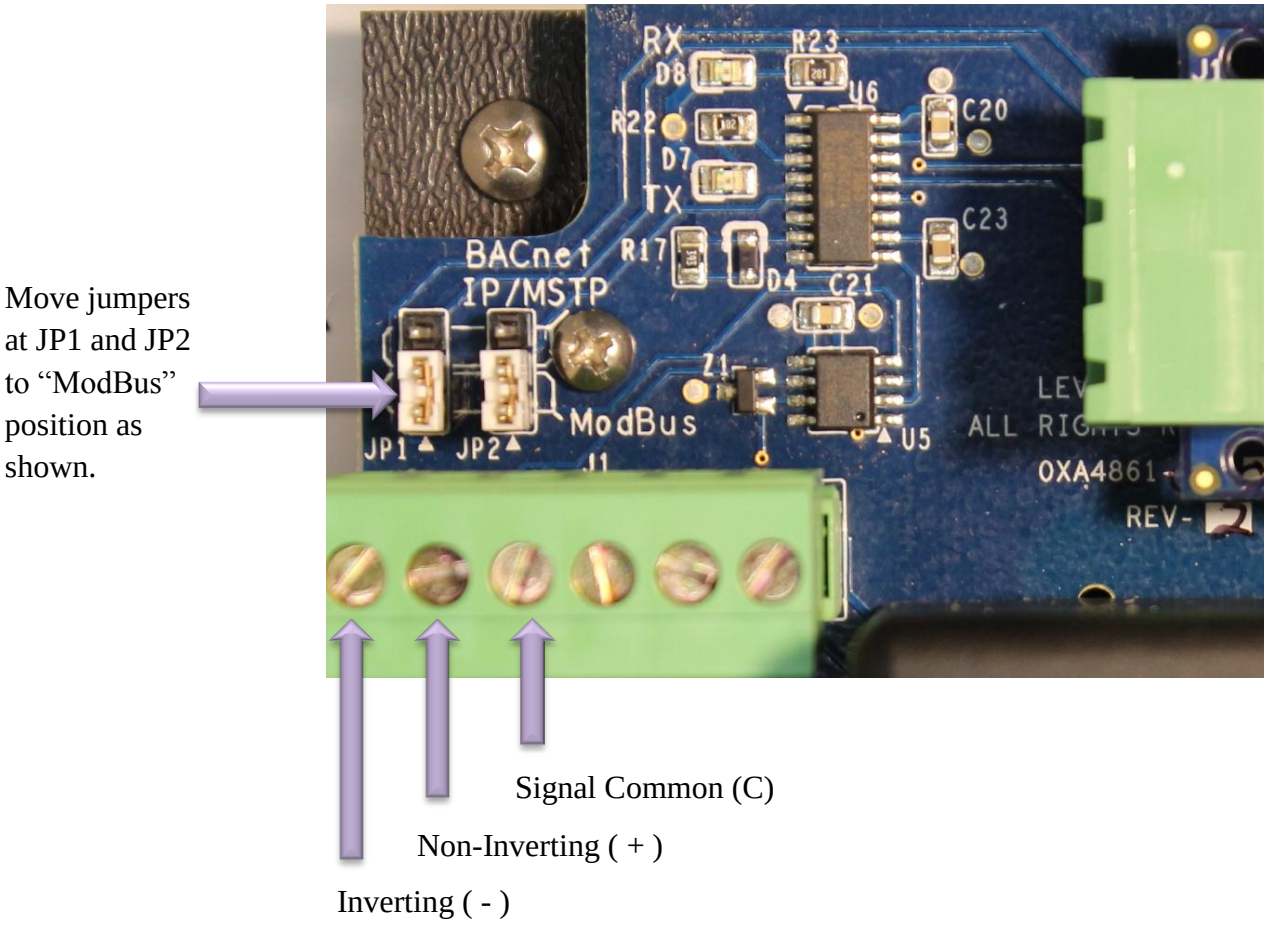
8.1 Connecting for History Data Extraction

To reduce risk of electric shock, always open or disconnect the circuit from the power distribution system of a building before servicing an electric meter. Use a properly rated voltage sensing device to confirm power is off.

1. Install meter as outlined in Section 3.
2. Change the JP1 and JP2 jumper settings as shown in Figure 19.
3. Use shielded twisted-pair cable to prevent interference. Connect Inverting (-), Non-Inverting (+), and Signal Common (C) wires using the 6-pin removable terminal block shown in Figure 19. Do not over-tighten the terminal screws. Modbus output is electrically isolated from input power.
4. Before energizing the meter close and secure the enclosure door.

To restore the meter to normal operation, jumpers at JP1 and JP2 must be returned to their default settings.

Figure 19. Base Unit Modbus RTU Connections for History Data Extraction



8.2 Data Extraction Procedure

Historical readings or "data profiles" are not stored in standard Modbus registers. Instead, the historical readings are provided as a stream of data, controlled by a date filter and number of readings to be extracted. The control options for the date and the number of profiles are made available in registers

0504-0506. **Sending large streams of historical data halts the meter computation to avoid conflicting processor demands. As such, large historical reads should not be used on a frequent basis**. Once the transfer completes, the meter will resume normal operations.

Setting the Date

The historical data access date provides filtering criteria for data retrieval. By default, all historical data access dates are "don't care" (0xFF). When a date value is "don't care", it has no effect on the filtering of historical data. Any other value acts as a filter for the data retrieved from memory. The date value specifies the oldest data to be retrieved. For instance, setting the historical data year to 0x08 will filter out any meter readings prior to 2008. Each part of the historical date is treated as an independent filter. Some examples are provided below in Table 8 to further illustrate.

Table 8. Setting the Historical Data Access Date

Year	Month	Date	Hour	Meter Readings Sent
0xFF	0xFF	0xFF	0xFF	Any
0x08	0xFF	0xFF	0xFF	Any reading in 2008 or later
0xFF	0x06	0xFF	0xFF	Any reading from June-Dec in any year
0x09	0x06	0xFF	0xFF	Any reading in June, 2009 or later
0xFF	0xFF	0xFF	0x11	Any reading after 5:00 PM on any day of any year
0x09	0x03	0x01	0xFF	Any reading on March 01, 2009 or later
0xFF	0xFF	0x1C	0x17	Any reading after 11:00 PM on the 28th to the end of the month

The historical data access date information is stored in registers 0504 and 0505 (0x01F8 and 0x01F9). The year and month are stored in register 0504, and the date and hour are stored in register 0505.

Initiating Data Retrieval and Controlling the Number of Profiles Sent

To initiate historical data retrieval, a read holding register command is issued to address 0506. The "number of registers" variable in the read command controls the number of historical profiles to be extracted. Once the desired number of readings has been found and transferred the transmission ends.

Historical Data Profile Structure

The historical data is transmitted in frames consisting of 48 bytes each. The frame structure is shown in Table 9.

Data profile information, except RTC, kWh and VAh, is saved in 16-bit floating point format using truncation of the least significant decimal information. To increase resolution from truncating data for storage, each part of the profile has an associated multiplier. When data is extracted, first make the 16-bit value into a 32-bit float by appending 0x7FFF and then multiply by the multiplier. VAh and kWh are stored as 32-bit floating point numbers and do not need a multiplier.

As an example of using the multiplier, assume the phase A voltage reading is 276.7 V. This value is divided by the multiplier (100) to become 2.767 (0x40311687) and is stored in the data profile as 0x4031. When translated back from hex to a float, 0x40317FFFbecomes 2.7734, and using the 100 multiplier gives a value of 277.34 V. This data condensing is used to increase storage capacity, and does not affect long term meter accuracy. The running kWh and VAh totals are a combination of two floating point numbers, which maintains accuracy beyond thousandths of a kWh, even when high values are reached.

Frame Item	**Size (bytes)**	**Multiplier**
Meter Address	1	n/a
Function Code (0x03)	1	n/a
Profile Memory Address (decreases with each frame)	2	n/a
Time of use Year	1	1
Time of use Month	1	1
Time of use Day	1	1
Time of use Hour	1	1
Time of use Minute	1	1
Time of use Second	1	1
Phase A Voltage	2	100
Phase A Voltage	2	100
Phase A Voltage	2	100
Phase A Current	2	100
Phase B Current	2	100

Phase C Current	2	100
Phase A Watts	2	100
Phase A Watts	2	100
Phase A Watts	2	100
Total kWh +	4	1
Total kWh -	4	1
Total kVA +	4	1
Total kVA -	4	1
Maximum Demand	2	100
CRC	2	n/a

Once one frame is finished transmitting, the next frame will begin automatically until the number of profiles left to send reaches zero. History data is transmitted in reverse chronological order—the most recent frame is transmitted first and the oldest frame is transmitted last.

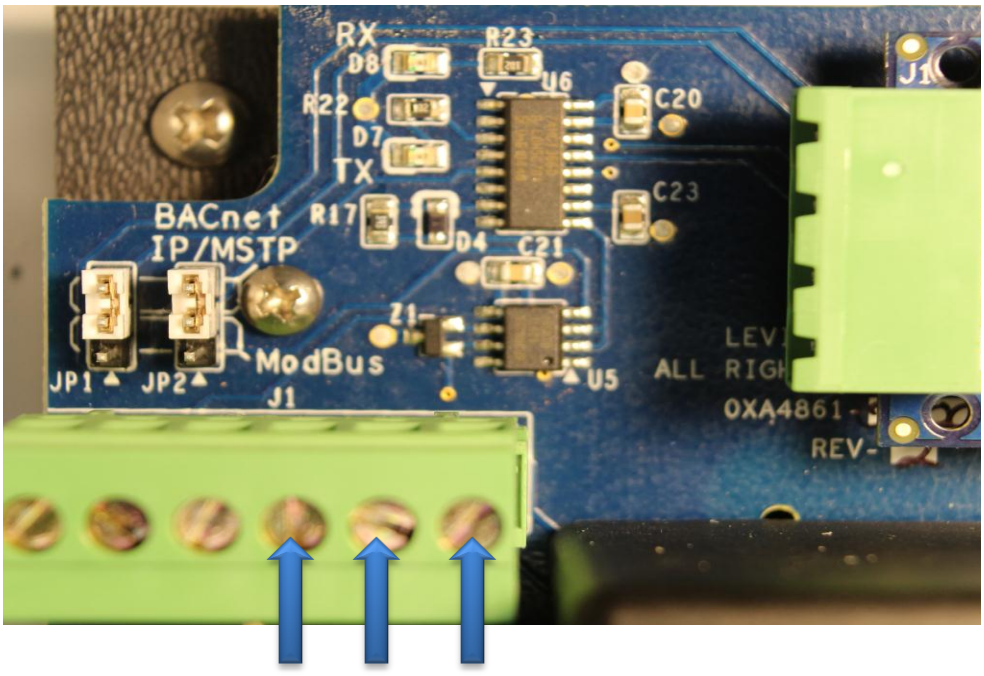
9. Series 3300/3500 Pulse Outputs

9.1 Connecting to the Pulse Output Terminals

To reduce risk of electric shock, always open or disconnect the circuit from the power distribution system of a building before servicing an electric meter. Use a properly rated voltage sensing device to confirm power is off.

1. Install meter as outlined in Section 3.
2. Communications cable shall enter at the TOP side of the enclosure as shown in Figure 13. Replace plastic cap with webbed bushing (provided).
3. Use shielded twisted-pair cable to prevent interference and connect to the 6-pin removable terminal block as shown in Figure 18. Two pins provide 10 watt-hour and 1 kWh pulse rates. Pulses at these terminals and positive (+) with respect to the shared common ("COM") terminal (-), and represent energy delivered (from grid). Do not over-tighten the terminal screws. Both pulse outputs are electrically isolated from input power and can be used independent of one another or simultaneously.
4. Before energizing the meter close and secure the enclosure door.

Figure 18. Pulse Output Connections



9.2 Connecting Pulse Outputs to Data Acquisition Equipment.

A variety of data acquisition equipment may be connected to the Series 3300/3500 pulse output terminals, included wireless pulse transceivers and data logging equipment. For information on Leviton's complete line of data acquisition products go to Leviton.com >Products>Submetering>Communication Systems. For information on Leviton's software solutions go to Leviton.com>Products>Submetering>Energy Manager Software.

10. Diagnostic Tools and Frequently Asked Questions

10.1 Diagnostic Tools

Several diagnostic tools built into the Series 3300/3500 meter should be utilized to ensure the meter and CTs are installed correctly and functioning properly.

1) Energy Flow arrow (see Section 4.1, Figure 12) – Indicates direction of 'energy flow' on amperage and kW screens.
    a. **For mono-directional metering applications the Energy Flow arrow should always point to the right**. If an Amperage or kW screen shows the arrow pointing to the left a current transformer may be installed backwards or on the wrong phase, or CT connections at the meter may be reversed or on the wrong phase. See Hookup Diagrams in Figures 8 through 11 for correct wiring and CT orientations.
    b. Blinking "A" on the Amperage screens – Indicates reverse energy flow. The
    c. Bi-directional metering is typically used in grid-tied applications where solar PV or energy from a source other than the utility grid may be interconnected to the metered service. CTs are located between the grid and the electrical service, and if the locally generated energy exceeds the service loads the grid will receive energy instead of delivering it. In such circumstances the Energy Flow arrow will point to left when energy is being received (at the grid) and point to the right when energy is being delivered from the grid.
2) Power Factor Screens – Except in rare circumstances where predominantly inductive loads are metered, Power Factor values should be between -0.5 and +0.5. An absolute value less than 0.5 indicates CTs installed on the wrong phase or backwards. Recheck wiring and CT orientations against the appropriate Hookup Diagram shown in Figures 8 through 11.

10.2 Frequently Asked Questions

Q: Can I use a single phase (split phase 3-wire) Series 3300/3500 meter on a three phase feed?
A: The Series 3300/3500 can monitor two phases of a three phase system (2 Phase 3 or 4 Wire) but cannot monitor Single Phase (Split Phase) 120/240V 3-Wire, nor 120V 2-Wire circuits. The line-to-line voltage display will not show 240V for the Split Phase.

Q: Can I route voltage input wires and current sensing leads through the same conduit?
A: Yes. CTs must have 18 AWG or heavier wires with proper VAC insulation rating (check local electrical code).

Q: Can I extend the CT leads?
A: Yes. You should try to avoid extending the native CT leads by locating the meter next to the circuit breaker. If you must extend the leads, take into consideration the following inaccuracy contributors. Here are some of the factors that will affect accuracy when using long CT leads:

1. Wire Length
   - Native CT length is best
   - Longer run decreases accuracy
2. CT wire gauge (18 AWG preferred)
   - Thinner wire > more resistance > affects accuracy
   - Thicker wire > more capacitance > affects accuracy
3. Conduit material
   - Metal conduit will effect accuracy
   - Non-metal conduit has minimal effect
4. High voltage wires run in parallel with CT wires inside the same conduit
   - Approximately 0.7%/100ft. deviation at 277V
   - Approximately 0.5%/100ft. deviation at 120V
   - Accuracy deviation increases as current increases on the voltage wires.
5. Wire type
   - When extending CT leads, twisted pair wire type gives better accuracy.

Q: How do I retrieve Data from the meter?
A: Data Acquisition equipment, also known as Automatic Meter Reading (AMR) and Middleware (between the consists of radio transmitters, repeaters, and a collector that monitors, records, and transmits data to energy management or billing software solutions. Various software solutions manage and display data in user-friendly formats. See Sections 6 and 7 or go to Leviton.com for more information.

Q: Why are solid core current transformers color coded (Black & white, red & white, and blue & white)?
A: Industry convention for color coding in 3 Phase 208V electrical systems assigns the color black to phase A, red to phase B, Blue to phase C, and white to Neutral. Leviton's 100A and 200A solid core CTs are coded with the same colors (on the body of the CTs and on the wires) to help installers get each CT placed on the correct hot leg. Further, the white half of the CT always faces incoming Line or source. Phase A CT (black) connects to CT1 at the meter, phase

B CT (Red) connects to CT2, and phase C CT (blue) connects to CT3. See hookup diagrams in figures 8 through 11.

Q: Can digital output wires be routed through the same conduit as voltage input and current sensing wires?
A: No. In accordance with NEC and UL requirements, Class 2 wiring (digital inputs/outputs) must be separated from Class 1 wiring. Digital output wires must enter the meter housing through the top of the enclosure, and voltage and CT wires must enter at bottom of enclosure. See Installation Instructions in Section 3.

Q: I still can't get my meter to work, what now?
A: Contact technical support at via phone or email; see Contact Information on following page.

11. Returned Material Policy and Warranty Information

After acceptance, all sales of meters are final. Leviton, in its sole discretion, authorizes product returns in appropriate circumstances, subject to such conditions as Leviton may specify. Any such return is subject to the express prior authorization and approval of Leviton. Buyer must notify Leviton at 800-736-6682 (telephone) or 503-404-5594 (fax) and request a Returned Material Authorization Number (RMA Number) and state the specific reason for return. Unauthorized returns will not be accepted.

When requesting an RMA Number please supply the following information:

1. Distributors name and address
2. Model number of meter
3. Original purchase order number
4. Reason for return

All paperwork and boxes must be marked with an RMA number issued by Leviton. All authorized returned materials must be shipped freight prepaid to Leviton to the address specified below. Leviton is not responsible for uninsured packages or packages lost by your carrier.

Leviton 20497 SW Teton Avenue Tualatin, Oregon 97062

All returns are subject to a handling/restocking charge, except for product shipped in error or products under warranty. All charges (modification, repair, restock etc) related to returned products will be determined by Leviton upon evaluation. All shipping costs are the responsibility of the buyer.

METERS RETURNED FOR CREDIT*

Replacement meter ordered

- *RMA Number requested by stocking distributor for credit must be accompanied by a purchase order for material of equal or greater value.* — 0% Restock Charge

NO replacement meter ordered — 25% Restock Charge

METERS RETURNED FOR REPAIR (STILL UNDER WARRANTY)*

No defects found	$75.00 evaluation charge
Defects not covered under warranty	Charges upon evaluation
Defects found covered under warranty	No Charge

METERS RETURNED FOR EVALUATION (NO LONGER UNDER WARRANTY)*

Evaluation charge of $75.00 applies

Other charges will apply depending on evaluation by Leviton

**Prices as of May 01, 2009 and subject to change*

12. Contact Information

Leviton Manufacturing Co., Inc. Global Headquarters
201 N. Service Rd. Melville, NY 11747-3138 • Tech Line: 1-800-824-3005 • FAX: 1-800-832-9538

Leviton Manufacturing Co., Inc. Lighting & Energy Solutions
20497 SW Teton Avenue, Tualatin, OR 97062 • Telephone: 1-800-736-6682 • FAX: 503-404-5594
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165 Hymus Boulevard, Pointe Claire, Quebec H9R 1E9 • Telephone: 1-800-469-7890 • FAX: 1-800-563-1853

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Visit our Website at www.leviton.com/les
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Appendix A

Modbus and BACnet Address Map

Address	Hex Value	Holding Register	Width (16-bit registers)	Description	Unit of Measure	Data Type	R/W	BACnet Object Type	BACnet Object Instance
Meter Readings									
0000	0000	40001	2	kWh from grid	kWh	FLOAT32	R	AI	1
0002	0002	40003	2	kWh to grid	kWh	FLOAT32	R	AI	2
0004	0004	40005	2	kVAh from grid	kVAh	FLOAT32	R	AI	3
0006	0006	40007	2	kVAh to grid	kVAh	FLOAT32	R	AI	4
0008	0008	40009	2	Total Power (A+B+C)	kW	FLOAT32	R	AI	5
0010	000A	40011	2	Total Apparent Power (A+B+C)	kVA	FLOAT32	R	AI	6
0012	000C	40013	2	Total Reactive Power (A+B+C)	kVAR	FLOAT32	R	AI	7
0014	000E	40015	2	Total Power Factor	N/A	FLOAT32	R	AI	8
0016	0010	40017	2	Phase A Voltage (L-N)	V	FLOAT32	R	AI	9
0018	0012	40019	2	Phase B Voltage (L-N)	V	FLOAT32	R	AI	10
0020	0014	40021	2	Phase C Voltage (L-N)	V	FLOAT32	R	AI	11
0022	0016	40023	2	Phase A Current	A	FLOAT32	R	AI	12
0024	0018	40025	2	Phase B Current	A	FLOAT32	R	AI	13
0026	001A	40027	2	Phase C Current	A	FLOAT32	R	AI	14
0028	001C	40029	2	Phase A Real Power	kW	FLOAT32	R	AI	15
0030	001E	40031	2	Phase B Real Power	kW	FLOAT32	R	AI	16
0032	0020	40033	2	Phase C Real Power	kW	FLOAT32	R	AI	17
0034	0022	40035	2	Phase A Apparent Power	kVA	FLOAT32	R	AI	18
0036	0024	40037	2	Phase B Apparent Power	kVA	FLOAT32	R	AI	19
0038	0026	40039	2	Phase C Apparent Power	kVA	FLOAT32	R	AI	20
0040	0028	40041	2	Phase A Reactive Power	kVAR	FLOAT32	R	AI	21
0042	002A	40043	2	Phase B Reactive Power	kVAR	FLOAT32	R	AI	22

Address	Hex Value	Holding Register	Width (16-bit registers)	Description	Unit of Measure	Data Type	R/W	BACnet Object Type	BACnet Object Instance
0044	002C	40045	2	Phase C Reactive Power	kVAR	FLOAT32	R	AI	23
0046	002E	40047	2	Phase A Power Factor	N/A	FLOAT32	R	AI	24
0048	0030	40049	2	Phase B Power Factor	N/A	FLOAT32	R	AI	25
0050	0032	40051	2	Phase C Power Factor	N/A	FLOAT32	R	AI	26
0052	0034	40053	2	Voltage A to B (L-L)	V	FLOAT32	R	AI	27
0054	0036	40055	2	Voltage B to C (L-L)	V	FLOAT32	R	AI	28
0056	0038	40057	2	Voltage C to A (L-L)	V	FLOAT32	R	AI	29
0058	003A	40059	2	Line Frequency	Hz	FLOAT32	R	AI	30
0060	003C	40061	2	Maximum Demand	kW	FLOAT32	R	AI	31
0062	003E	40063	1	Maximum Demand Timestamp: Year/Month	Year/Month	Two UINT8	R	AI	32 & 33
0063	003F	40064	1	Maximum Demand Timestamp: Day/Hour	Day/Hour	Two UINT8	R	AI	34 & 35
0064	0040	40065	1	Maximum Demand Timestamp: Minute/Second	Min/Sec	Two UINT8	R	AI	36 & 37
0065	0041	40066	1	Power Loss Timestamp: Year/Month	Year/Month	Two UINT8	R	AI	38 & 39
0066	0042	40067	1	Power Loss Timestamp: Day/Hour	Day/Hour	Two UINT8	R	AI	40 & 41
0067	0043	40068	1	Power Loss Timestamp: Minute/Second	Min/Sec	Two UINT8	R	AI	42 & 43
0068	0044	40069	1	RTC Year/Month	Year/Month	Two UINT8	R/W	AV	44 & 45
0069	0045	40070	1	RTC Day/Hour	Day/Hour	Two UINT8	R/W	AV	46 & 47
0070	0046	40071	1	RTC Minute/Second	Min/Sec	Two UINT8	R/W	AV	48 & 49
0071	0047	40072	1	RTC Day of the Week	N/A	8-bit enumerated in LSB[1]	R	AI	50
0072	0048	40073	2	Net kWh ("from grid" minus "to grid")	kWh	FLOAT32	R	AI	51
0074	004A	40075	2	Net kVAh ("from grid" minus "to grid")	kVAh	FLOAT32	R	AI	52

Address	Hex Value	Holding Register	Width (16-bit registers)	Description	Unit of Measure	Data Type	R/W	BACnet Object Type	BACnet Object Instance
Control Registers									
0500	01F4	40501	1	Maximum Demand Reset	N/A	Write 0x00AA to initiate reset	W	AV	53
Meter Information									
5000	1388	45001	2	Meter Serial Number	N/A	UINT32	R	AI	54
5002	138A	45003	1	Hardware Version/Software Version	N/A	Two 8-bit hex values[3]	R	AI	55 & 56
5003	138B	45004	1	Program Number	N/A	INT16	R	AI	57
5004	138C	45005	1	Meter Type/Demand Reset Counter	N/A	8-bit enumerated[4] and 8-bit integer	R	AI	58 & 59
5005	138D	45006	1	Demand Calc Interval/EEPROM Save Interval	N/A	8-bit enumerated in LSB[5]	R/W	AV	60

[1] To maintain cohesiveness of date, time and day of week, it is recommended that the four RTC registers be updated as a group
[2] Day of the week: 0x01 to 0x07 (0x01 = Sunday)
[3] Each 8-bit version number is encoded as two 4-bit hex digits, for example the value 0x19 represents version 1.9
[4] Meter type has a fixed value of 4
[5] See "Encoding of Demand Calculation and History Data Save Interval" below

Encoding of Demand Calculation and History Data Save Interval

Register address 5005 is encoded as two 8-bit enumerated values, with demand calculation interval in the MSB and history data save interval in the LSB.

Demand interval (MSB) defines the interval for calculation of maximum demand:

0 = 5 minute interval
1 = 10 min interval
Other values return an error

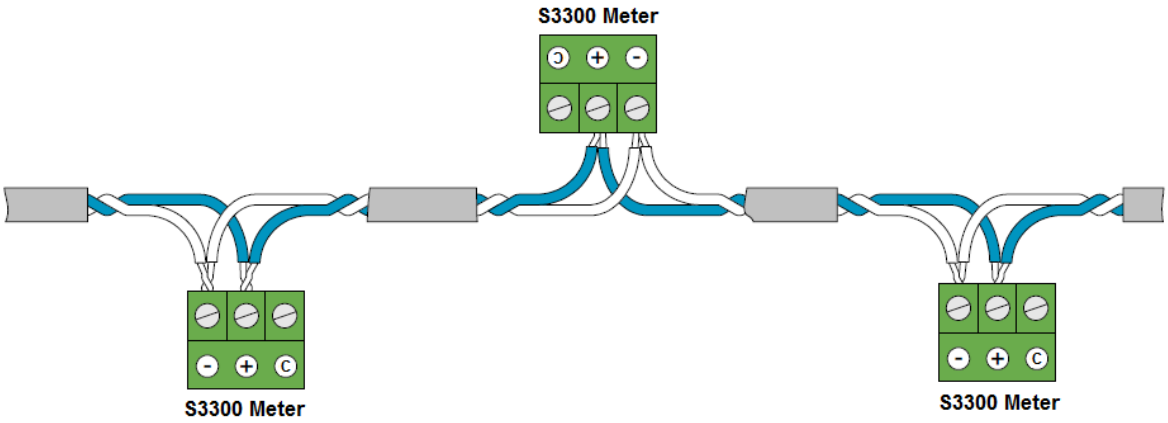
History interval (LSB) defines the interval for saving history data in EEPROM:
1 = 5 minute interval
3 = 15 minute interval
6 = 30 minute interval
12 = 60 minute interval
Other values return an error

When this register is read, the demand calculation interval appears in the MSB and history data save interval is in the LSB.

The method of writing to the register depends on the communication protocol. For Modbus RTU, the demand calculation interval value is written to the LSB and the history data save interval is fixed at 5 minutes and cannot be changed. For all other protocols, the demand calculation interval value is written to the MSB and the history data save interval value is written to the LSB.

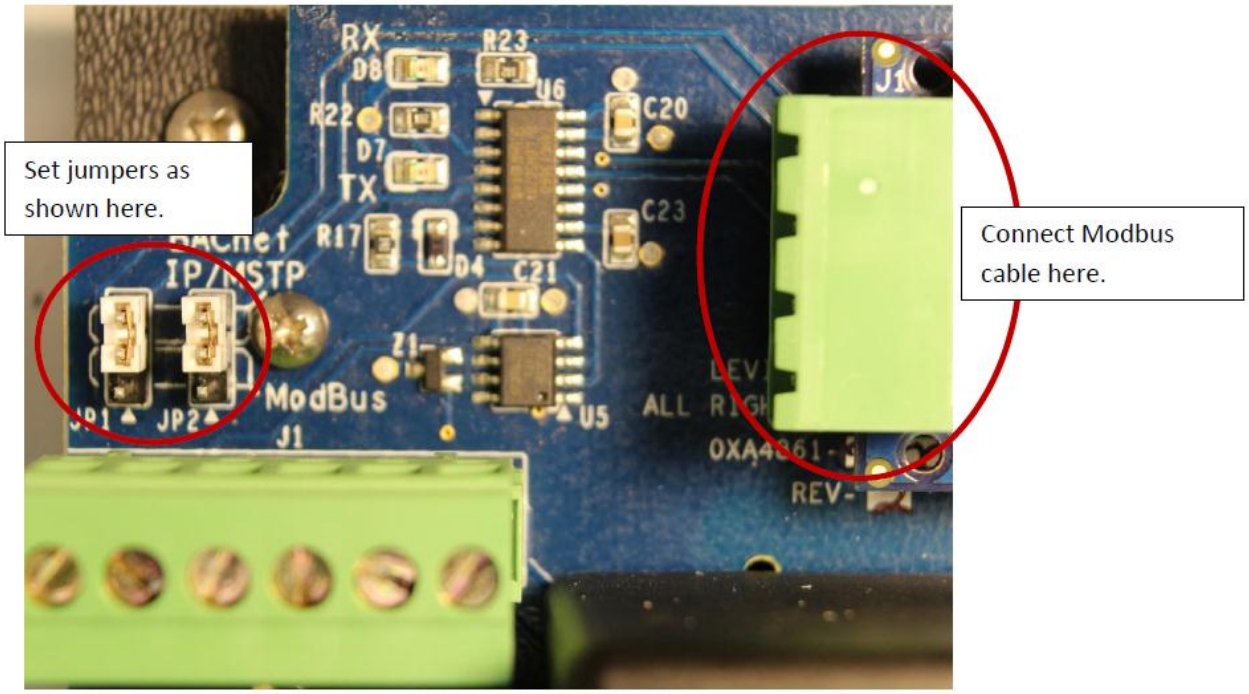
Appendix B

S3300 meters support an RS-485 communication network and meters can be daisy-chained up to 32 units. A connection example is shown below.



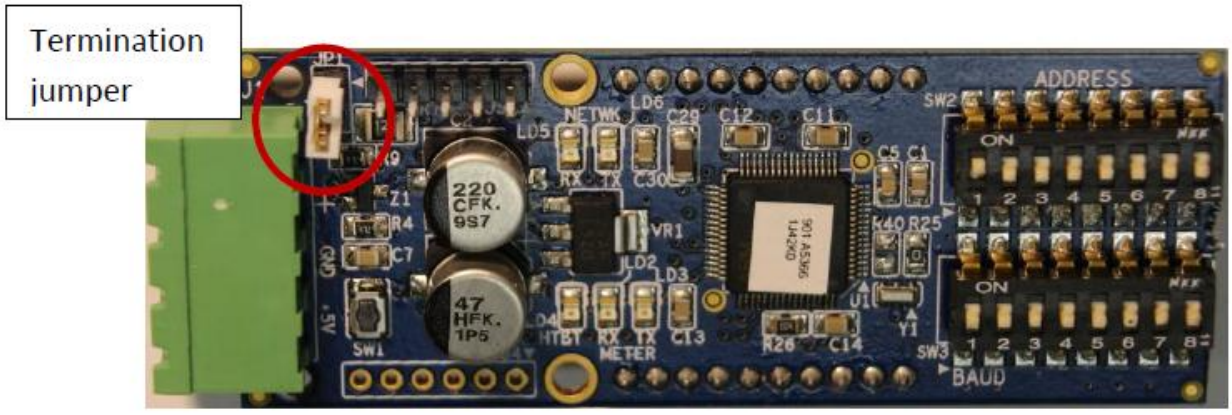
Appendix C

How to Set Up Leviton Modbus RTU Communication Modules



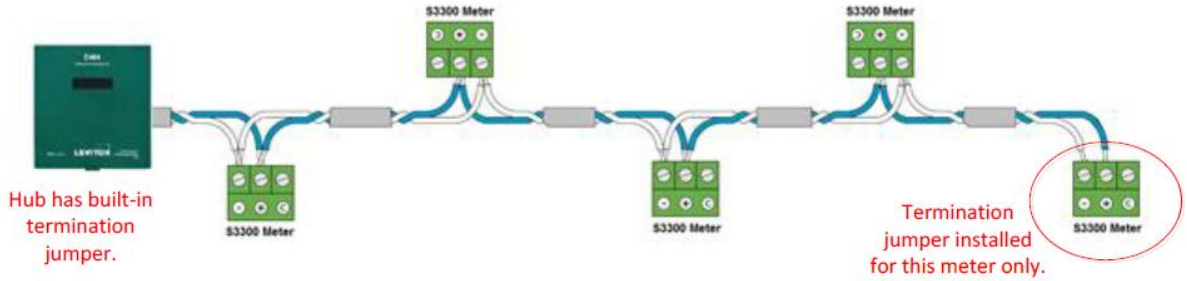
Communication Module Jumpers

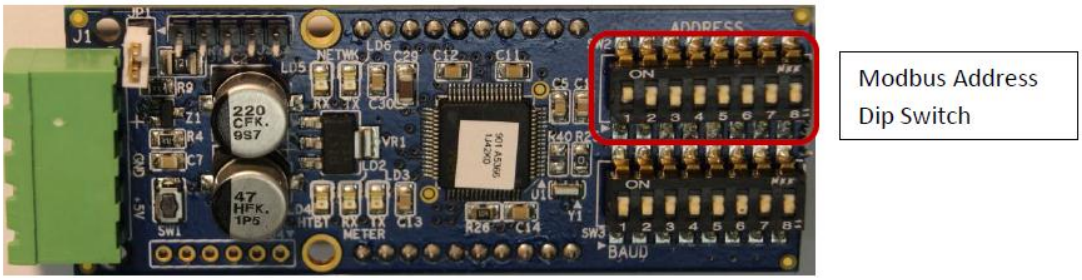
To use the Modbus RTU communication module the jumpers shown above must be set in the top position, which is the default setting from factory. *The jumpers must be set as shown in the diagram above regardless of the communication protocol in use.*



RS485 Line (Twisted Pair) Termination Jumper

When installed as shown in the diagram above, this jumper enables the internal RC line termination circuit. The jumper must be installed if the meter is the last device in the daisy chain and otherwise must be removed. In the example shown below, only the meter at the far right of the diagram needs a termination jumper because it is the last device in the daisy chain.





Modbus Address Dip Switch

The Modbus address is set using the bank of dip switches circled in red in the diagram above**. Every meter in the Modbus network must have a unique Modbus address.** The address is not set at the factory—it must be set appropriately at installation. Zero (all switches off) is not a valid Modbus address. The address 255 (all switches on) is generally reserved and not recommended. The table below shows how to set the switches for each address.

Modbus Address	Dip Switch Number							
	1	2	3	4	5	6	7	8
1	On	Off	Off	Off	Off	Off	Off	Off
2	Off	On	Off	Off	Off	Off	Off	Off
3	On	On	Off	Off	Off	Off	Off	Off
4	Off	Off	On	Off	Off	Off	Off	Off
5	On	Off	On	Off	Off	Off	Off	Off
6	Off	On	On	Off	Off	Off	Off	Off
7	On	On	On	Off	Off	Off	Off	Off
8	Off	Off	Off	On	Off	Off	Off	Off
9	On	Off	Off	On	Off	Off	Off	Off
10	Off	On	Off	On	Off	Off	Off	Off
11	On	On	Off	On	Off	Off	Off	Off
12	Off	Off	On	On	Off	Off	Off	Off
13	On	Off	On	On	Off	Off	Off	Off
14	Off	On	On	On	Off	Off	Off	Off
15	On	On	On	On	Off	Off	Off	Off
16	Off	Off	Off	Off	On	Off	Off	Off
17	On	Off	Off	Off	On	Off	Off	Off
18	Off	On	Off	Off	On	Off	Off	Off
19	On	On	Off	Off	On	Off	Off	Off
20	Off	Off	On	Off	On	Off	Off	Off
21	On	Off	On	Off	On	Off	Off	Off
22	Off	On	On	Off	On	Off	Off	Off
23	On	On	On	Off	On	Off	Off	Off
24	Off	Off	Off	On	On	Off	Off	Off
25	On	Off	Off	On	On	Off	Off	Off
26	Off	On	Off	On	On	Off	Off	Off
27	On	On	Off	On	On	Off	Off	Off
28	Off	Off	On	On	On	Off	Off	Off
29	On	Off	On	On	On	Off	Off	Off
30	Off	On	On	On	On	Off	Off	Off
31	On	On	On	On	On	Off	Off	Off
32	Off	Off	Off	Off	Off	On	Off	Off
33	On	Off	Off	Off	Off	On	Off	Off
34	Off	On	Off	Off	Off	On	Off	Off
35	On	On	Off	Off	Off	On	Off	Off
36	Off	Off	On	Off	Off	On	Off	Off
37	On	Off	On	Off	Off	On	Off	Off
38	Off	On	On	Off	Off	On	Off	Off
39	On	On	On	Off	Off	On	Off	Off
40	Off	Off	Off	On	Off	On	Off	Off
41	On	Off	Off	On	Off	On	Off	Off
42	Off	On	Off	On	Off	On	Off	Off
43	On	On	Off	On	Off	On	Off	Off

Modbus Address	Dip Switch Number							
	1	2	3	4	5	6	7	8
44	Off	Off	On	On	Off	On	Off	Off
45	On	Off	On	On	Off	On	Off	Off
46	Off	On	On	On	Off	On	Off	Off
47	On	On	On	On	Off	On	Off	Off
48	Off	Off	Off	Off	On	On	Off	Off
49	On	Off	Off	Off	On	On	Off	Off
50	Off	On	Off	Off	On	On	Off	Off
51	On	On	Off	Off	On	On	Off	Off
52	Off	Off	On	Off	On	On	Off	Off
53	On	Off	On	Off	On	On	Off	Off
54	Off	On	On	Off	On	On	Off	Off
55	On	On	On	Off	On	On	Off	Off
56	Off	Off	Off	On	On	On	Off	Off
57	On	Off	Off	On	On	On	Off	Off
58	Off	On	Off	On	On	On	Off	Off
59	On	On	Off	On	On	On	Off	Off
60	Off	Off	On	On	On	On	Off	Off
61	On	Off	On	On	On	On	Off	Off
62	Off	On	On	On	On	On	Off	Off
63	On	On	On	On	On	On	Off	Off
64	Off	Off	Off	Off	Off	Off	On	Off
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69	On	Off	On	Off	Off	Off	On	Off
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73	On	Off	Off	On	Off	Off	On	Off
74	Off	On	Off	On	Off	Off	On	Off
75	On	On	Off	On	Off	Off	On	Off
76	Off	Off	On	On	Off	Off	On	Off
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78	Off	On	On	On	Off	Off	On	Off
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81	On	Off	Off	Off	On	Off	On	Off
82	Off	On	Off	Off	On	Off	On	Off
83	On	On	Off	Off	On	Off	On	Off
84	Off	Off	On	Off	On	Off	On	Off
85	On	Off	On	Off	On	Off	On	Off
86	Off	On	On	Off	On	Off	On	Off

Modbus Address	Dip Switch Number							
	1	2	3	4	5	6	7	8
87	On	On	On	Off	On	Off	On	Off
88	Off	Off	Off	On	On	Off	On	Off
89	On	Off	Off	On	On	Off	On	Off
90	Off	On	Off	On	On	Off	On	Off
91	On	On	Off	On	On	Off	On	Off
92	Off	Off	On	On	On	Off	On	Off
93	On	Off	On	On	On	Off	On	Off
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124	Off	Off	On	On	On	On	On	Off
125	On	Off	On	On	On	On	On	Off
126	Off	On	On	On	On	On	On	Off
127	On	On	On	On	On	On	On	Off
128	Off	Off	Off	Off	Off	Off	Off	On
129	On	Off	Off	Off	Off	Off	Off	On

Modbus Address	Dip Switch Number							
	1	2	3	4	5	6	7	8
130	Off	On	Off	Off	Off	Off	Off	On
131	On	On	Off	Off	Off	Off	Off	On
132	Off	Off	On	Off	Off	Off	Off	On
133	On	Off	On	Off	Off	Off	Off	On
134	Off	On	On	Off	Off	Off	Off	On
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168	Off	Off	Off	On	Off	On	Off	On
169	On	Off	Off	On	Off	On	Off	On
170	Off	On	Off	On	Off	On	Off	On
171	On	On	Off	On	Off	On	Off	On
172	Off	Off	On	On	Off	On	Off	On

Modbus Address	Dip Switch Number							
	1	2	3	4	5	6	7	8
173	On	Off	On	On	Off	On	Off	On
174	Off	On	On	On	Off	On	Off	On
175	On	On	On	On	Off	On	Off	On
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212	Off	Off	On	Off	On	Off	On	On
213	On	Off	On	Off	On	Off	On	On
214	Off	On	On	Off	On	Off	On	On

Modbus Address	Dip Switch Number							
	1	2	3	4	5	6	7	8
215	On	On	On	Off	On	Off	On	On
216	Off	Off	Off	On	On	Off	On	On
217	On	Off	Off	On	On	Off	On	On
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222	Off	On	On	On	On	Off	On	On
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252	Off	Off	On	On	On	On	On	On
253	On	Off	On	On	On	On	On	On
254	Off	On	On	On	On	On	On	On